

unfavorable conditions of the city, and because he can see conditions of the atmosphere far to seaward and far along the Sierra Nevada to the southeast and northeast that are unknown to the city station. At the Sierra Nevada geodetic stations the observer can usually predict, from his observations, the weather for two days in advance.

From the station on Tamalpais notices of vessels could be given in clear weather when they are on the horizon 60 miles distant and directly seaward, or far to the southward, or to the northwestward, even beyond and over the lowlands inside of Point Reyes. And even when the vessel is only seen in some small open patch, an observation on her from the station for direction and depression would give an approximate position which could be telegraphed to the city for information or assistance. And in heavy southwest weather the condition of the bar when breaking, or the danger of some vessel could be promptly made known to the city.

This letter and attending reports were sufficient to justify Professor Moore in his determination to give every opportunity for a full investigation of the merits of this station and, if worthy, to give his hearty support to the projected new mountain observatory. Petitions from the citizens of San Francisco in October, 1896, were followed by immediate action by Hon. J. Sterling Morton, then Secretary of Agriculture, who ordered that—

The necessity of instituting the station be given careful consideration, bearing in mind that stations are made for the good of the Weather Bureau service, which is intended to be strictly utilitarian; therefore, neither personal nor political influences are to be considered when new stations are proposed or other innovations suggested.

The investigation made at that time did not suffice to overcome the objections as to expense and the uncertainty as to the possible value to the forecaster of a station on Mount Tamalpais.

On May 20, 1897, Mr. W. H. Hammon, Forecast Official, reopened the question and offered to contribute his own time, viz, his annual vacation leave and a considerable part of the expense if he might be allowed to occupy this station and, by personal experience, determine its desirability. His offer was accepted, the necessary apparatus was secured, and on July 10 Mr. Hammon was assured by the Chief of Bureau that—

It is believed, therefore, that whatever is done in this direction should be well done, and that the instruments and apparatus should be carefully installed with a view to obtaining the best possible results; but it must be distinctly understood that you are to use your own judgment as to the amount of time and work you can expend in connection with this new station, as work of more immediate and pressing importance demands your attention, namely, the inauguration of a more efficient climate and crop service for the State of California. The fact that your numerous requests for increased expenditures and for additional assistance have not been complied with should not be taken as an evidence that the Central Office does not appreciate your work or that it does not wish to honor all reasonable recommendations which you make. The fact is, that during several years past there has been no increase in the appropriation for the support of the Weather Bureau, while the amount of work has vastly increased. This makes it absolutely impossible for the Chief of Bureau to exceed a certain limit of expansion and development.

These conditions are thus made plain, so that you may not misunderstand the attitude of the Central Office, and so that you may be in a position to assist rather than to embarrass the Chief of Bureau.

It is presumed that you have fully considered the amount of work that will be required of your station in connection with the transfer of climate and crop service from Sacramento, and that you still believe you can care for this additional station.

It is desired that you temporarily establish the station on Mount Tamalpais, and after a reasonable time make a definite report as to the value of the observations in assisting you to make better weather forecasts. If it can be shown that the observations are of sufficient importance an increase in our present appropriations will be asked of Congress in order to enable the permanent establishment of the station.

Mr. Hammon occupied the new station during the whole month of September and made two reports, i. e., one on the value of the station, which was published in the September REVIEW, and one on the location of the temporary station, which we publish in the present REVIEW, together with the accompanying chart showing the relation of Tamalpais to the surrounding region.

Mr. Hammon's report on the value of the station was convincing to the Chief of Bureau, who, in congratulating him, said:

I have been very much pleased with your report, which is lucid and valuable. Your investigation has convinced me of the utility of placing an observatory on this promontory and it is regretted that we have not the means to at once take up this work. If the estimated increase in our appropriation is given for the fiscal year beginning July 1, 1898, you can expect to have the station established according to the plan outlined in your report of September 30, 1896, * * * and that one observer be permanently detailed for work at the mountain station and that he be in telegraphic communication with the San Francisco office, and that the mountain station be considered as a part of your own.

Excellent suggestions are often received by the Chief as to probable and possible and hypothetical improvements in the Weather Bureau service, and this present history simply presents one more illustration of the general principle that such suggestions are not sufficient in and of themselves, but the authors must establish the fact that the suggestions are really valuable as increasing the utility of the service.

REPORT ON THE LOCATION AND ELEVATION OF INSTRUMENTS AT MOUNT TAMALPAIS, CAL.

By W. H. HAMMON, Forecast Official (dated September 25, 1897).

The region about Mount Tamalpais is shown on the accompanying chart, No. VI. There are three peaks in an east and west line, the extreme eastern one being about $1\frac{1}{2}$ mile from the extreme western one. The eastern peak is 2,592 feet in height; the western one about 2,620, and the middle one, equidistant from the other two, is about 2,500. The saddles between these peaks have elevations of between 2,200 and 2,300 feet. The surface slopes very abruptly from this ridge to less than 1,000 feet within a mile and in almost every direction, the slope being much more abrupt from the eastern peak, the summit of which is but a sharp point, except for a ridge about 100 yards long, extending to the southwestward. From this eastern peak, where the wind vane is established, the surface slopes to an elevation of 100 to 300 feet within 2 miles in every direction, except toward the west, and on that side it drops to the saddle, 250 feet below and about 1,000 feet distant. This peak is, therefore, an isolated cone, rising nearly half a mile above the entire surrounding region, with the exception of the west, where, perhaps, 30° of the horizon are obstructed by the two other peaks. A thermometer shelter may be placed above ground on a knoll, about 20 feet high, to the west of the hotel. For the present, however, a "cotton-region shelter," placed in the shade of the deep veranda on the west side of the hotel, is satisfactory. The tavern of Tamalpais is 800 feet from the flagstaff on the summit of the eastern peak and 240 feet below it. The anemometer is on a support in the place formerly occupied by the flagstaff, but the self-register is kept at the tavern, and a connection is made by a telegraph cable about 1,000 feet long.

The wind vane and anemometer are mounted upon a combined shaft, 18 feet long. This is placed upon the topmost rock of the eastern peak of the mountain. The shaft, being hollow, was set over an iron flagstaff $1\frac{1}{2}$ inch in diameter, which had been previously leaded in the rock, and was cut off about 2 feet above the rock. After setting the shaft over it, cement was run into the hollow shaft, filling the space between them. The guy rods were leaded into holes drilled into the rock. The shaft is perfectly stable and unusually free from vibration. The rock is 2,592 feet above sea level (Coast and Geodetic Survey), thus making the vane 2,610 feet above sea level and the anemometer cups about 1 foot lower.

The surface slopes downward from the point where the shaft is erected at angles varying from 10° to 40° . The vane is apparently free from all disturbing influences, and in brisk to high winds remains almost absolutely free from motion.

The thermometers are mounted in a "cotton-region shelter,"

which is spiked to a post of the porch at the west end of the Mount Tamalpais Tavern. The Tavern is 200 feet lower than the place where the wind vane is mounted and 800 feet southwest from that point. There is an excellent circulation of air about and through the shelter, and at the same time it is shielded from the direct solar rays. The bulbs of the dry and wet thermometers are 5.6 feet above the floor of the porch and about an equal distance below the roof. The wet bulb is arranged for a stationary hygrometer, with cup and wick attached. However, it is always well ventilated, by fanning, whenever a brisk wind is not blowing.

The rain gauge stands at the top of a gently sloping knoll in the broad saddle which separates the eastern peak from the middle peak. It is about 1,000 feet southwest of the eastern peak and 200 feet lower. It is 75 feet west of the pavilion connected with the hotel, the roof of which rises about 20 feet above the gauge.

The barometer is hung 18 inches east of the door of the office, which opens to the northward. There is a small window in the south wall opposite, but the window sill is 5 feet

above the floor, consequently it gives the best light to the opposite side of the room. There is some doubt as to the elevation. The cistern is 4 feet above the bench mark of the railroad at the switch that is distant 50 feet north. This bench mark was found to be 210 feet below the bench of the Coast and Geodetic Survey, which is in the topmost rock of the eastern peak.

This bench mark bears the inscription "Elevation 2,592 feet." This makes the elevation of cistern 2,386. In applying corrections for elevation I have used the following:

Temperature.	Reduced to sea level.
50°	+ 2.48
60°	+ 2.43
70°	+ 2.38
80°	+ 2.33

I find these corrections give a reading 0.02 to 0.03 too high as compared with San Francisco when the temperature on the mountain is as low as that at San Francisco, but the reading is too low by 0.03 to 0.06 when the mountain temperature is 15° to 20° higher than in the city, as is frequently the case.

METEOROLOGICAL TABLES AND CHARTS.

By A. J. HENRY, Chief of Division of Records and Meteorological Data.

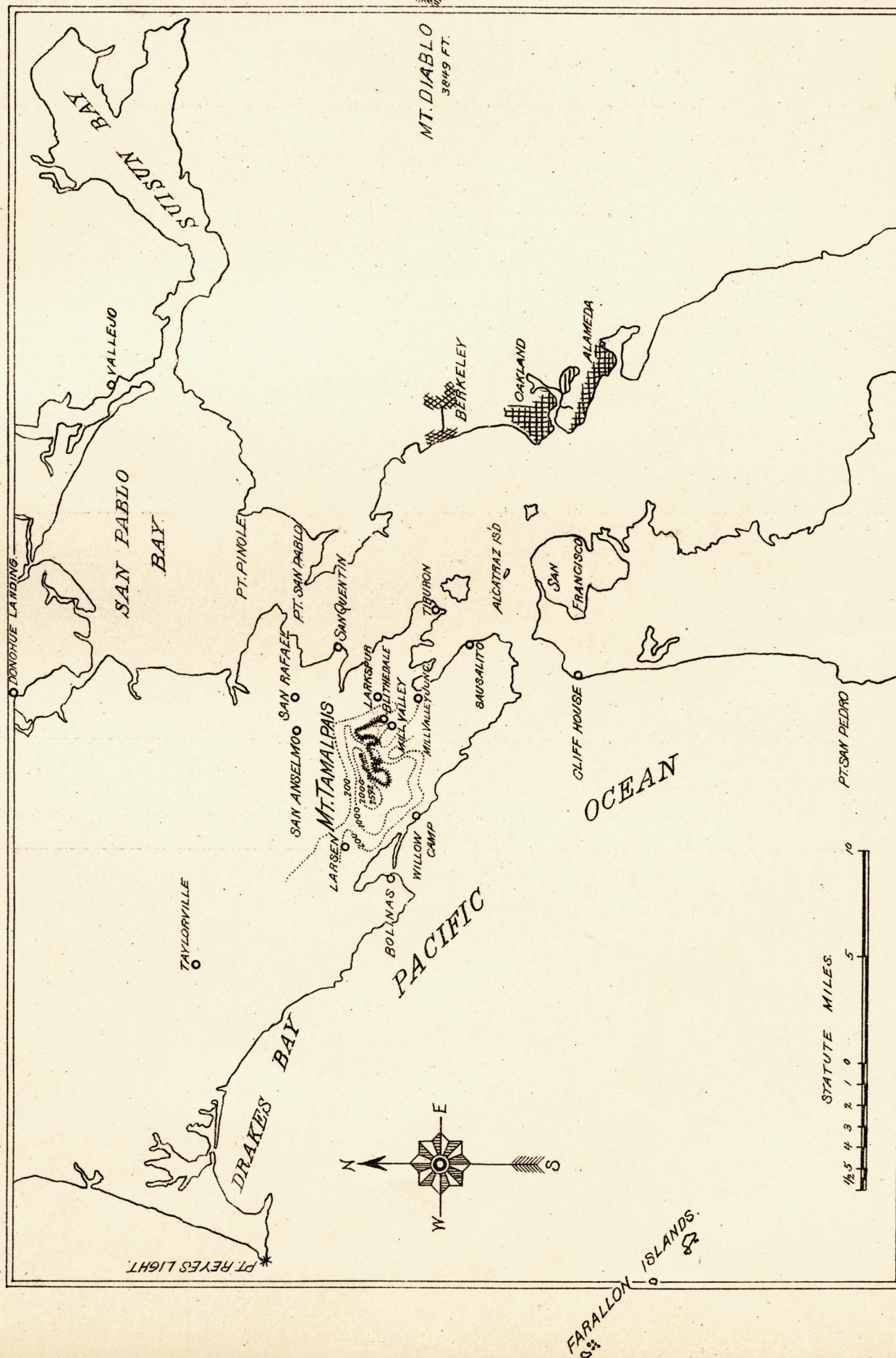
For text descriptive of tables and charts see page 448 of REVIEW for October, 1897.

REV—4

Chart VIII. Mount Tamalpais Station and Surroundings.

MT. ST. HELENA.
56 MILES DISTANT FROM MT. TAMALPAIS.

SIERRA NEVADA MTS.
155 MILES DISTANT FROM MT. TAMALPAIS.



MT. HAMILTON.
67 MILES DISTANT FROM MT. TAMALPAIS.